2005 MOURNING DOVE POPULATION AND RESEARCH STATUS REPORT

John H. Schulz
Resource Scientist

2004 MOURNING DOVE HARVESTS

(√) Missouri's Small Game Post-season Harvest Survey

Preliminary harvest data for Missouri during 2004 show 40,807 mourning dove hunters harvested 769,990 doves statewide; a 6.3% decrease in hunters and a 4.5% decrease in harvest from 2003. The estimated 2004 dove harvest increased 5.1% from the 5-year average (1999-03) (732,423 average harvest; SD 51,043) and decreased 1.7% from the 10-year average (1994-03) (783,524 average harvest; SD 85,462). Statewide, dove hunters averaged 4.4 doves per day and 4.3 days of hunting per season in 2004 compared to 4.4 doves per day and 4.3 days per season in 2003. Average season bag for 2004 was 18.9 mourning doves compared to 18.5 in 2003. Regional data for 2004 showed Northeastern Riverbreaks and Northeastern Ozark Border with the highest harvests (194,463 and 144,633 doves respectively) and Northern Riverbreaks the lowest (10,186 doves; Figure 1).

Although the dove harvest and number of hunters showed little change last year, long-term trends of harvest and hunters continue to show declines (Figure 2), with daily bag and average days afield remaining relatively stable or slightly increasing (Figure 3). Although the number of hunters and harvested doves has declined since the 1970s, remaining dove hunters are hunting about the same number days, while gradually increasing their daily harvest.

(√) Migratory Bird Harvest Information Program (HIP)

In addition to post-season mail harvest surveys conducted by individual states, the migratory bird harvest information program (HIP) was developed to fill the need for reliable harvest data to help guide management decisions for migratory game birds. Federal waterfowl harvest surveys have existed since 1952. The historical waterfowl surveys, however, lacked a reliable sampling frame of names and addresses of all migratory bird hunters and, therefore, did not adequately address webless migratory game birds (e.g., mourning doves). The HIP harvest survey provides reliable estimates of hunter activity and harvest at national and regional scales for all migratory game bird species, and provides harvest estimates at the state scale that are comparable among states.

During 2004, Texas led the Central Management Unit (CMU; Figure 4) in mourning dove harvest with 5.7 million birds killed by 287,700 dove hunters (Figure 5). During 2004,

Missouri was second in mourning dove harvest with 775,900 doves killed by 41,600 dove hunters (Figure 6). Arkansas and Kansas were third and fourth in harvest and hunter numbers.

(√) SEASON FORMAT CONTINUES

Missouri will continue a 70-day season and 12-bird bag limit this fall. Following is background information explaining how we arrived at this format.

Prior to 1990, Missouri opted for a 70-day season and 10-bird bag limit. The reason for the voluntary bag limit reduction from 12 to 10 doves was to express concern to the U.S. Fish and Wildlife Service (USFWS) and other states in the Central Management Unit (CMU; Figure 4) over long-term population trend declines. In 1990, however, we took advantage of the actual allotted 12-bird bag limit that corresponded with the 70-day season provided by the federal frameworks. With this increase in bag limit, we could still hunt doves the first 10-days of November. In 1992, however, Missouri chose the 15-bird bag limit which required a 60-day season format. This decision eliminated late season mourning dove hunting opportunities for approximately 75,000 to 80,000 quail and pheasant hunters in early November. After the 1992 regulation change the Department received numerous comments and suggestions concerning lost dove hunting opportunities during the first 10-days of November. Based on those concerns, a split season was established during 1999 and 2000 to provide dove hunting opportunity over a longer time period.

Prior to the split season format, field staff reported that they knew of few, if any, hunters that hunted doves during October. After the 1999 split dove season, however, the Department received several calls and letters from hunters that had become accustomed to dove hunting in October. Data were gathered from various sources to learn more about impacts of the split season. Results showed that the vast majority of dove hunters (76%) and conservation agents (66%) wanted to return to a continuous season format. Although a majority of hunters (53%) and conservation agents (51%) wanted to retain the 15-bird limit and 60-day season, data from managed dove shooting areas showed that most hunters seldom shoot their full bag limit (Figure 7). Thus, a return to the slightly lower bag limit and slightly longer season was considered the best compromise.

(√) EURASIAN COLLARED-DOVES AND WHITE-WINGED DOVES IN AGGREGATE

For the third year, Missouri dove hunters will be allowed to shoot 12 mourning doves, Eurasian collared-doves, and/or white-winged doves in aggregate. The primary reason for this change was to provide for the incidental take of these birds during the regular mourning dove hunting season. An early season migratory bird hunting pamphlet has been developed which will assist dove hunters with the identification of these species.

Eurasian collared-doves are a relatively new and exotic species that is spreading across the U.S. from east to west. The bird is native to northern Africa and rapidly colonized Europe during the 1940s and 1950s. The bird was first observed in southern Florida in the mid-1980s,

most likely brought ashore during a tropical storm. Currently, the birds appear to have statewide distribution in Missouri. Eurasian collared-doves have a characteristic black ring at the base of the neck or nape, have a broad squared-off tail compared to the narrow and pointed tail of a mourning dove, and are much larger than mourning doves.

In addition, white-winged doves have been expanding their range northward from southern Texas, into Oklahoma, Kansas, Nebraska, and Missouri. White-winged doves are easily distinguished in the field by large white wing patches that are visible either in-flight or on the roost.

(√) MOURNING DOVE POPULATIONS TRENDS/SURVEYS

The Department annually conducts two dove surveys in Missouri, the Mourning Dove Call-Count Survey (CCS) and the Roadside Dove Survey (RDS). The CCS is a national survey conducted annually in cooperation with the states and the USFWS. The CCS was established in 1966, and currently contains ≥1,000 survey routes nationally. The CCS was established to provide regional and national population indices. In Missouri, the CCS index is the average number of doves heard calling per mile along 20 standard routes. The RDS is an independent survey conducted annually by Department staff; the survey contains usable data going back to 1948. The RDS provides an index of doves seen, rather than calling, along standardized routes throughout the state (some counties excluded). The RDS provides regional data for Missouri that the CCS cannot supply. There is very strong long-term relationship between both surveys over several decades; however, the two surveys may show opposite trends within a given year.

(√) National Mourning Dove Call-Count Survey

For Missouri, CCS route regression analysis between 2004 and 2005 showed a nonsignificant ($P > 0.1$) increase of 17.3% (90% CI _7.6% to 42.2%; Figure 8). During the last 10-years (1996-05), Missouri's CCS dove trend data showed a significant ($P < 0.05$) decrease of 3.0% (90% CI _5.2% to _0.8%) per year. Long-term trends from Missouri's CCS data continued to show a significant ($P < 0.05$) decline of 2.0% (90% CI _3.4% to _0.6%) per year from 1966-2005. Throughout the 14 Central Management Unit (CMU; Figure 4) states, 2005 dove populations showed a nonsignificant ($P > 0.01$) increase of 6.4% (90% CI _0.7% to 13.4%) compared to 2004 population indices.

(√) Missouri's Roadside Mourning Dove Survey

Statewide results of the 2005 RDS showed 1.24 doves/mile; a 13.3% decrease compared to 2004 (Figure 8), a 8.8% decrease from the statewide 5-year average (2000-04; 1.36 doves/mile, SD 0.11), and a 3.9% decrease from the statewide 10-year average (1995-04; 1.29 doves/mile, SD 0.15; Table 1). Regionally (Figure 1), Mississippi Lowlands had the highest index (2.09 doves/mile) and the Ozark Plateau the lowest (0.70 doves/mile; Table 1).

This year the CCS data show a slight increase, and RDS data show slight trend decreases (Figure 8), indicating stable to slightly higher population levels compared to previous years. Depending upon weather conditions the last week of August and early September, and food

availability to concentrate doves, hunting opportunities are anticipated to be good.

(√) Long-Term Population Trends

Long-term mourning dove trends from both RDS and CCS surveys provide an interesting picture (Figure 8). Since 1966, both surveys show a strong relationship (r = 0.76; 1966-2002); a stronger relationship exists for the RDS and the North American Breeding Bird Survey (BBS) index of mourning doves (r = 0.89; 1966-1996). If we assume that these 2 (or 3) surveys are tracking similar aspects of the mourning dove population, we see 3 things from Figure 6. First, we see that although trends have declined since 1966, the trend has been relatively stable in the last 10 years. Second, we see that although trends are lower today than during the late 1960s, RDS trends are near levels similar to the late 1940s and early 1950s. Third, we see that some phenomena occurred during the late 1950s and early 1960s that caused trends to climb rapidly. Regionally, we can speculate that some beneficial and broad scale land use changes occurred in the Mississippi Lowlands, Northeast Riverbreaks, Northeastern Riverbreaks, and Western Prairie during the late 1950s and early 1960s (Figure 9-16).

From a national perspective, some controversy exists about the relative merits of the BBS and CCS surveys, and the ability of the surveys to track changes in mourning dove population trends. Although the CCS protocol is specifically designed for doves, the number of survey routes is less compared to the BBS, which leads to concerns about the sensitivity of the survey to detect trends. In addition, these trend declines may not be indicative of actual changes in populations, but rather an index to unmated males in the breeding season, changes in habitat along standardized survey routes, or other factors. Although uncertain in some respects, these data provide a useful and generalized picture of relative population trends for use in providing hunting forecast, etc. These uncertain data, however, show the need for improving the reliability of the information used the harvest management decision making process (i.e., establishing and changing hunting regulations). This was the primary motivation for the establishment and approval of the National Mourning Dove Harvest Management Plan adopted by all flyway councils and the International Association of Fish and Wildlife Agencies.

(√) MONITORING DOVE SHOOTING FIELD MANAGEMENT

Mourning doves can provide abundant hunting opportunities close to where urban residents live. Unlike other game animals that require relatively large areas of habitat for hunting, dove shooting field management can routinely occur on sunflower fields ranging in size from 5 to 30 acres. However, considerable uncertainty exists concerning mourning dove harvest management strategies; e.g., half day vs. all day hunting, large daily harvests in relatively short periods vs. small daily harvests spread out over a longer interval.

To address this set of management questions, biologists from several conservation areas with active dove shooting management programs met in July, 2000 to develop a long-term Adaptive Resource Management (ARM) process; the program was expanded to include additional areas in 2003. The ARM process works best with management problems such as this

one because the problem is small enough to explicitly define and develop a meaningful monitoring program. Thus, the overall goal of the ARM program is learn how different dove management strategies impact our objective of maximizing dove hunting opportunities on public areas. To monitor our success in meeting our objective, we are measuring the number of hunters, hours hunted, doves killed, and shots fired on select conservation areas along with regulation type and number/quality of managed fields (Table 2). As a part of the monitoring program, dove hunters on these areas will be required to report the number of doves killed, shots fired, and hours hunted. Data obtained from 9 conservation areas during 2004 show that many dove hunters likely enjoy the opportunity to see and shoot numerous doves regardless of their ability to actually harvest and take home some birds (Table 3). This fall a new orange colored daily hunting card will be used by dove hunters on these areas to help collect the necessary information to meet the objectives of this program.

It is important to note that the few areas involved in this long-term monitoring program represent just a few of the numerous mourning dove hunting opportunities on public areas found in Missouri. The Department provides managed mourning dove hunting opportunities on approximately 5,000 acres located on 150 fields located on 92 public conservation areas scattered around the state. Check the public web sometime after the middle of August to locate the locations of managed areas near you (http://mdc4.mdc.state.mo.us/atlasdovemgmt/dove.aspx)

MOURNING DOVE RESEARCH UPDATE

(√) National Pilot Banding Study

To improve future harvest management decisions at the national, regional, and statewide levels, population information is needed to make better informed decisions. New population models are being constructed using existing historical data to help make more informed harvest management strategies and to illustrate which pieces of new population information are most critical. Efforts are also underway to initiate a national mourning dove banding program to obtain modern information on band reporting rates and harvest rates for use in the population models, which in turn will be used making decisions about future changes in hunting regulations. To date, these efforts have received wide spread support (e.g., flyway technical committees, flyway councils, joint flyway councils, IAFWA subcommittees and working groups). Missouri is banding doves on 11 areas, and attaching bands to almost 2,500 birds annually.

Hunters that shoot and retrieve banded birds are asked to cal **1-800-327-BAND (2263)**. Hunters will be asked by the operator to provide the band number, the location where the bird was killed, and the date when the bird was killed. By reporting band numbers dove hunters will be helping to manage our dove resource for future generations.

(√) Wing Survey and Recruitment

The National Dove Plan recognizes the need for mourning dove recruitment information. Recruitment indices for other migratory game birds are obtained from wing collections conducted by mail survey. However, annual postage costs for these surveys are high. Collecting

mourning dove wings from check stations at managed hunting areas is an alternative, less expensive way to collect large samples of wings. The samples from these areas, however, would have less extensive geographic distribution than a sample derived from a traditional mail wing survey. Thus, check station samples may not be as representative as samples from a mail survey. A 3-year study, therefore, has been initiated to collect samples of wings using the 2 different collection methods, compare state-level and management unit-level estimates of age ratios derived from the 2 methods, and provide a cost comparison. The results of this project will enable us to determine the most cost-effective way to conduct an annual operational mourning dove wing collection survey that will provide valid indices of recruitment at the desired geographic scale. This project will also help us determine appropriate sample sizes for the survey. Other research is underway to calibrate these indices to actual estimates of recruitment (see Agroforestry Mourning Dove Project Update below).

(√) Long-term Localized Banding Study

Given the increasing popularity of dove hunting near urban areas, local dove harvests and associated intensity of managing sunflower fields have increased substantially on numerous conservation areas. Managers and biologists, however, have limited knowledge of how these locally intensive harvests effect populations. For example, what subpopulations or subgroups of mourning doves are harvested on these areas; locally established populations or different migratory subpopulations passing through the area? What are some plausible explanations for observed annual fluctuations in year-to-year harvests on these managed areas?

Using a collaborative effort between research and management staff to address these issues, a long-term banding study (>10-years) was initiated in 2000 at the James A. Reed Memorial Wildlife Area. Trapping annually occurs during the summer (July 1 – August 21) and winter (January 1 – February 28); 1,000 doves are the target sample size for each trapping session. It will be several years before any meaningful conclusions can be made.

(√) Trichomoniasis Study Update

Trichomonas gallinae is a pear-shaped flagellated protozoan which sometimes causes a fatal disease called trichomoniasis in mourning doves, other pigeon-like birds, and some raptors. The disease is thought to be transmitted when infected adult doves feed nestlings, and/or contaminate drinking water and food sources (i.e., bird feeders or baths) used by other doves. Weather conditions may contribute to disease transmission; e.g., extended hot dry weather may force birds to use limited but contaminated food and water supplies. Each summer several outbreaks of the disease occur around the state killing an unknown number of doves.

Trichomonads are usually found in the oral-nasal cavity, or anterior end of the digestive and respiratory tracts of infected birds. Symptoms include difficulty flying, listlessness, swollen necks, and cheesy yellowish lesions in the oral cavity. The infected individual dies when the lesions block the trachea and oral cavity making eating and respiration impossible.

Building reliable information about the impacts of trichomoniasis on mourning doves may become an important element in our understanding of mourning dove population dynamics. Therefore, we monitored the presence and annual variation of *Trichomonas gallinae* for six years in a local mourning dove population using hunter-killed doves each year, explore possible reasons for observed changes in annual presence of the disease, and evaluate the practicality of a large-scale volunteer reporting program to monitor *T. gallinae* trends in mourning dove populations. During 1998–2003, we sampled 4,052 hunter-killed doves for the presence of *T. gallinae* and found 226 (5.6%) that tested positive (4.4% – 10.6% range). During the 6-year study we also received 161 credible reports of trichomoniasis from volunteers, of which 60 (37.3%) were confirmed by observation of the diagnostic lesion; credible reports were related to observations at recreational bird feeders in urban/suburban locations. Results of our hunter-killed sampling effort were relatively consistent during the 6-year period, with the presence of *T. gallinae* below most previously reported estimates for mourning doves. Our results also indicate that asymptomatic carries in one segment of the population may provide a mechanism for spreading the disease to naive segments of the population. Determining the occurrence of seasonal epizootics based upon the combined results of our volunteer monitoring program and monitoring of hunter-killed doves proved problematic for several reasons because neither method provided a reliable tool for determining disease's population status on a local or broad scale.

Final publication of this investigation will be available in the fall 2005 issue of the journal called **Avian Diseases**. Funding and assistance for this study was provided by 1998 Webless Migratory Game Bird Research Program (U.S. Fish and Wildlife Service and the U.S. Geological Survey-Biological Resources Division), Missouri Department of Conservation-Conservation Research Center (Federal Aid in Wildlife Restoration Project W-13-R-52), and BioMed Diagnostics (San Jose, CA).

Mourning Doves and Lead (Pb) Shot Research

(√) Pb Pellet Deposition and Availability

Mourning dove hunting is becoming increasingly popular, especially hunting over managed shooting fields. Given the possible increase in lead (Pb) shot availability on these conservation areas, we estimated availability and ingestion of spent shot at the Eagle Bluffs Conservation Area (EBCA; hunted with non-toxic shot) and the James A. Reed Memorial Wildlife Area (JARWA; hunted with Pb shot) in Missouri. During 1998, we collected soil samples one or 2 weeks prior to the hunting season (prehunt) and after 4 days of dove hunting (posthunt). We also collected information on number of doves harvested, number of shots fired, shotgun gauge, and shotshell size used.

Dove carcasses were collected on both areas during 1998-99. At EBCA, 60 hunters deposited an estimated 64,775 pellets/ha of non-toxic shot on or around the managed field. At JARWA, approximately 1,086,275 pellets/ha of Pb shot were deposited by 728 hunters. Our posthunt estimates of spent shot availability from soil sampling were 0 pellets/ha for EBCA and 6,342 pellets/ha for JARWA. Our findings suggest that existing soil sampling protocols may not provide accurate estimates of spent shot availability in managed dove shooting fields. During

1998-99, 15 of 310 (4.8%) mourning doves collected from EBCA had ingested non-toxic shot. For doves that ingested shot, 6 (40.0%) contained ≥7 shot pellets. In comparison, only 2 of 574 (0.3%) doves collected from JARWA had ingested Pb shot.

Because a greater proportion of doves ingested multiple steel pellets compared to Pb pellets, we suggest that doves feeding in fields hunted with Pb shot may succumb to acute Pb toxicosis and thus become unavailable to harvest, resulting in an underestimate of ingestion rates. Although further research is needed to test this hypothesis, our findings may partially explain why previous studies have shown few doves with ingested Pb shot despite feeding on areas with high Pb shot availability. Follow-up research projects have been initiated that will provide more reliable information for possible changes in dove hunting regulations. The projects include investigations exploring effects of acute and chronic Pb toxicosis, shot selection by doves according to shot type (e.g., Pb and steel). Full details of the earlier investigation are available in the **Wildlife Society Bulletin 2002, 30(1): 112-120**.

(√) Acute Lead (Pb) Toxicosis

Previous research has suggested that mourning doves may ingest numerous lead pellets, succumb to lead toxicosis, and die in a relatively short time period; i.e., an *acute lead toxicosis hypothesis*. Therefore, we conducted an experiment test this hypothesis by administering mourning doves a range of lead pellet dosages, monitoring pellet retention and short-term survival, and measuring related physiological characteristics. We conducted three trials of the experiment with 60 birds in each. We assigned doves to one of seven treatments using #7_ lead pellets; i.e., control, 2, 4, 8, 12, 18, and 24 pellets. Initially, we observed considerable variation in pellet retention among treatments based on 48 h post-treatment x-rays. Therefore, we regrouped mourning doves by the number of pellets observed 48 h post-treatment; i.e., ≤2 lead pellets, 3 – 4, 5 – 8, 9 – 12, and 13 – 19. To monitor the effects of lead we measured body mass, heterophil:lymphocyte (H:L) ratios, packed-cell volume (PCV), and five blood plasma chemistries. All surviving birds were necropsied at 21-days post-treatment. We measured blood lead levels pre- and post-treatment. At necropsy we collected liver and kidney tissue samples to measure lead levels. Of the 179 mourning doves used, 104 died by the 21-day post-treatment period (deceased doves), 53 survived to the 21-day post-treatment period (survivors), and the 22 controls survived to 21-days. Within 24 h of treatment, blood lead levels increased almost twice as fast for deceased doves compared to survivors. During the first week, H:L ratios increased twice as fast for deceased doves than with survivors. The 21-day post-treatment pooled survival estimates ranged from 0.57 (95% CI: 0.44 – 0.74) for ≤2 lead pellets to 0.083 (95% CI: 0.022 – 0.31) for 13–19 lead pellets with significant differences among the five survival distributions. When controlling for dove pre-treatment body mass, each additional lead pellet increased the hazard of death by 18.0% (95% CI: 1.132 – 1.230, P-value <0.0001) and 25.7% (95% CI: 1.175 – 1.345, P-value <0.0001) for males and females respectively. For each 1 g increase in pre-treatment body mass, the hazard of death decreased 2.5% (P-value = 0.04) for males and 3.8% (P-value = 0.02) for females. Deceased doves had the highest lead levels in liver (49.20 ± 3.23 ppm) and kidney (258.16 ± 21.85 ppm) tissues, while controls showed the lowest levels (liver, 0.08 ± 0.041 ppm; kidney, 0.17 ± 0.10 ppm). For control and treatment doves surviving 21-days, there were no differences in calcium, total protein, aspartate aminotransferase (AST), uric acid,

and creatine kinase (CK; all $P < 0.05$). We observed simultaneous increases in blood lead levels and H:L ratios whereas PCV values declined. Although our results support an acute lead toxicosis hypothesis, further research is necessary to investigate the number of doves that ingest lead pellets and the relationship to pellet ingestion rates and pellet availability.

Funding and support for this study were provided by the Missouri Department of Conservation's Resource Science Center, and the University of Missouri's Department of Fisheries and Wildlife Sciences and Veterinary Medicine Diagnostic Laboratory. All animal care and use during these experiments were approved by the University of Missouri Animal Care and Use Committee (Protocol Reference No. 3870).

(√) Small Game Hunter Attitudes Towards Nontoxic Shot

There is growing concern about the exposure of upland game birds to spent lead shot, and further restrictions are likely. Hunter attitudes and their acceptance of further lead shot restrictions, however, play an important role in the policy making process. Therefore, we assessed the attitudes of small game hunters in Missouri towards a nontoxic shot shell regulation for small game hunting in general, and specifically for mourning dove hunting. Although most hunters were against further lead shot restrictions, certain subgroups were significantly more opposed; e.g., upland hunters, dove hunters, waterfowl hunters, hunters using primarily private land, hunters with more years of experience, male hunters, hunters with a rural background, and older hunters. With regard to lead shot restrictions specifically related to mourning dove hunting regulation changes, most hunters opposed further restrictions; however, a significant portion of non-dove hunters expressed *no opinion*. Building upon historical lessons from nontoxic shot waterfowl regulations, our results provide valuable information to help policy makers understand that the majority of small game hunters and dove hunters are decidedly against further restrictions of lead shot. Additional information explaining or describing hunter attitudes and perceptions concerning further lead shot restrictions will form the basis for informational and educational programs that need to accompany any future legislation aimed at reducing avian lead exposure in upland habitats.

Funding and support for this study were provided by the Missouri Department of Conservation's Resource Science Center, and the University of Missouri's Department of Fisheries and Wildlife Sciences.

(√) Nontoxic Shot and Crippling Rates

There is growing concern about the exposure of mourning doves to spent lead shot, and further expansion of lead shot restrictions will likely involve a contentious policy debate. Because the debate will likely include speculation about whether nontoxic shot requirements will result in increased crippling loss of mourning doves, we evaluated waterfowl crippling rates in the United States prior to, during, and after regulations requiring nontoxic shot for waterfowl hunting were implemented, and used this information to make inferences about mourning dove crippling rates if nontoxic shot regulations are enacted. We found differences in moving average crippling rates among the three treatment periods for ducks. Pre-nontoxic shot period crippling

rates were lower than 5-year phase-in period crippling rates, but higher than nontoxic shot period crippling rates. Similarly, we observed differences in moving average crippling rates among the three treatment periods for geese. Pre-nontoxic shot and 5-year phase-in period crippling rates were both greater than nontoxic shot period crippling rates, but not significantly different from one another. Regardless of why the observed increases in reported waterfowl crippling rates during the phase-in period occurred, the decline that followed full implementation of the nontoxic shot regulation is of ultimate importance when considering the impacts of lead shot restrictions for mourning doves. We infer that if further lead shot restrictions are enacted for dove hunting we will observe similar increases followed by decreases in reported crippling rates.

Funding and support for this investigation were provided by the Missouri Department of Conservation's Resource Science Center, and the University of Missouri's Department of Fisheries and Wildlife Sciences and Veterinary Medicine Diagnostic Laboratory.

(√) Third Transmitter Implant Study Completed

Although it has been ≥40 years since the development of wildlife radio telemetry, there continues to be uncertainty about the effects of transmitters on individually marked birds, and its effects on the resulting information. It is critical to understand how radio transmitters and their attachment techniques impact marked individuals and the resulting information. Each transmitter attachment technique is a compromise between minimizing potential negative effects of carrying the transmitter, and maximizing transmitter retention. Many studies assess only overt, deleterious effects when studying transmitter effects. However, subtle physiological effects caused by attachment techniques might compromise the integrity of resulting information. Our objectives, therefore, were to assess the efficacy of subcutaneous implants, and determine the physiological effects on mourning doves using heterophil:lymphocyte (H:L) ratios, blood plasma chemistries, and fecal glucocorticoid measures. We conducted two trials with 60 mourning doves; one in summer/fall (trial #1) and one in fall/winter (trial #2). For each trial, we assigned 15 male and 15 female doves to either a subcutaneous implant treatment, or a control group. During the two trials, we observed no differences in body weights, H:L ratios, fecal corticosterone levels, or blood plasma chemistries between mourning doves with subcutaneous implants and the control group. The entire surgical procedure required 8–14 min to implant subcutaneous radio transmitters, which is similar to external transmitter attachment procedures. Given the ultimate use of the information obtained from telemetry projects and the cost of the resulting initiatives, expenditures associated with rigorous experimental evaluations can only improve the basis of reliable knowledge used in making management decisions.

Funding for this study was provided by 2001 Webless Migratory Game Bird Research Program (U.S. Fish and Wildlife Service and the U.S. Geological Survey-Biological Resources Division), Missouri Department of Conservation-Conservation Research Center (Federal Aid in Wildlife Restoration Project W-13-R-56), University of Missouri (Department of Fisheries and Wildlife Sciences; Veterinary Medical Teaching Hospital; Veterinary Diagnostic Laboratory), and Advanced Telemetry Systems (Isanti, Minnesota).

(√) Agroforestry and Mourning Dove Research Update

The future of dove management depends primarily upon harvest management and our understanding of how harvest affects dove populations. As outlined in the National Dove Plan, long-term dove harvest management decisions must be based upon mechanistic population models in hopefully ≥5 years after implementation of the initial Central Management Unit (CMU) harvest management strategy, and the models will require modern estimates of demographic characteristics (e.g., recruitment, survival). Therefore, a key and implicit objective of the agroforestry/dove recruitment project is to obtain estimates of annual recruitment for development of reproduction models that can eventually be coupled with survival models to produce a set of population models for use in harvest management of mourning doves.

In the context of the changes in anticipated future harvest management decisions for mourning doves, recruitment estimates ($\hat{R}$) obtained from radio marked HY individuals would become one of the critical elements used in the population models along with estimates of age-specific annual survival ($\hat{S}_{AHY}$ and $\hat{S}_{HY}$), and harvest rates ($\hat{h}$), and critical in understanding and interpreting data from wing collection surveys. Recruitment estimates and associated annual variation obtained from field observation of radio marked birds will provide an additional and independent validation of recruitment estimates generated from change-in-ratio estimators from wing collection surveys.

The parameter *number of birds shot and not retrieved* will provide a local estimate of reported crippling rate. These data will be compared with reported crippling rates from HIP and historical crippling rates from observation studies (e.g., *spy blinds*). Given crippling estimates obtained from our radio marked doves, we'll have an opportunity to compared and calibrate report and observed crippling rates with actual or *real* crippling rates of bird shot and not retrieved. Given our ability to remotely monitoring the presence/absence of radio marked doves, we'll be able to estimate daily harvest rates.

Despite the benefits directly related to mourning dove hunting opportunities at the national and regional level, no experiments have evaluated the efficacy of different sizes and configurations of sunflower plantings to attract and concentrate mourning doves for harvest at the local level. The size, location, and arrangement of sunflower fields will be experimentally evaluated to determine possible relationships to hunting opportunity, harvest, and harvest rates. This will have an immediate and direct benefit to MDC land managers engaged in mourning dove shooting field management.

In early April, we planted 1,448 trees in the experimental agroforestry plots. These plots will be used to determine optimum and effective field size for establishing mourning dove shooting fields. To date we have instrumented 33 doves with subcutaneously implanted radio transmitters with external antennas (12 HY-all captured in traps and 21 AHY females; mean surgery time = 15 min, SD = 6). We have had 6 mortality/found transmitter occasions (3 AHY, 3 HY). From our radioed adult females, we have located and are monitoring 5 nests; currently 4 are active, 1 has 2 squabs that should be ready for transmitter implantation in early June. Two other nests have 1 egg, 1 nest was either depredated or lost due to bad weather and 1 nest had two eggs but we are no longer able to check that nest.

This is the first field season of a 5-6 year project. By summer of 2006 we should have a full sample of >200 radio transmitters on birds during the nesting season.

Table 1. Percent change of the 2005 Roadside Mourning Dove Survey relative to 2004, 5-year (2000 – 04), and 10-year (1995 – 04) averages.

Zoogeographic Regions	2005 Index[a]	2-Year (2004 – 05) % Change	5-Year (2000 – 04) % Change	10-Year (1995 – 04) % Change
Northwest Prairie (11)[b]	1.83	1.9	4.4	12.1
Northern Riverbreaks (11)	1.29	-16.0	-10.8	0.0
Northeast Riverbreaks (20)	1.13	-25.7	-17.8	-10.6
Western Prairie (12)	1.40	-12.7	-18.1	-22.0
Western Ozark Border (13)	1.56	-7.0	2.3	4.5
Ozark Plateau (24)	0.70	9.6	21.0	25.4
Northern and Eastern Ozark Border (12)	0.94	19.7	-6.8	-9.1
Mississippi Lowlands (7)	2.09	-35.2	-27.0	-12.7
STATEWIDE (110)	1.24	-13.3	-8.8	-3.9

[a]Survey index is equal to the number of mourning doves observed per mile.
[b]Number of counties within zoogeographic region with a completed and returned survey route.

Table 2. Dove harvest characteristics during September 2004 from conservation areas cooperating with an Adaptive Resource Management (ARM) program to evaluate the effects of different hunter and harvest management strategies on the goal of maximizing hunting opportunities[1].

Area								N	
A. A. Busc									
Bois D'Ar									
Columbia Bot									
Eagle Bluff									
Otter Sloug									
Pony Expre									
J. A. Reed Me									
Talbot C									
Ten Mile Po									
TOTA									

[1]It is important to note that these areas represent just a few dove hunting opportunities on public areas, and are part of a long-term management experiment. The Department provides managed mourning dove hunting opportunities on approximately 5,000 acres located on 150 fields located on 92 public conservation areas.

Table 3. The distribution of the mourning dove bag by the number hunters on 9 conservation areas during September 2004 (see Figure 7 for an average distribution of all areas combined).[1]

DAILY BAG	ABCA	BDCA	CBCA	PECA	RMWA	TOTAL	%[2]
0	418	315	179	196	580	1688	36.5
1	108	90	96	87	138	519	11.2
2	57	47	80	53	112	349	7.6
3	64	34	59	40	75	272	5.9
4	34	26	43	31	71	205	4.4
5	17	16	45	43	60	181	3.9
6	19	20	49	31	37	156	3.4
7	9	6	37	32	33	117	2.5
8	8	4	44	22	35	113	2.4
9	7	7	34	7	22	77	1.7
10	5	6	49	16	40	116	2.5
11	5	3	38	7	28	81	1.8
12	17	43	496	34	156	746	16.1
TOTAL	**768**	**617**	**1249**	**599**	**1387**	**4620**	**100**

[1]It is important to note that these areas represent just a few dove hunting opportunities on public areas, and are part of a long-term management experiment. The Department provides managed mourning dove hunting opportunities on approximately 5,000 acres located on 150 fields located on 92 public conservation areas.

[2]Proportion of all areas combined.

ABCA = A. A. Busch CA

BDCA = Bois D'Arc CA

CBCA = Columbia Bottom CA

EBCA = Eagle Bluffs CA (not available in 2004)

OSCA = Otter Slough CA (not available in 2004)

PECA = Pony Express CA

RMWA = J. A. Reed Mem. WA

TACA = Talbot CA (not available in 2004)

TMCA = Ten Mile Pond CA (not available in 2004

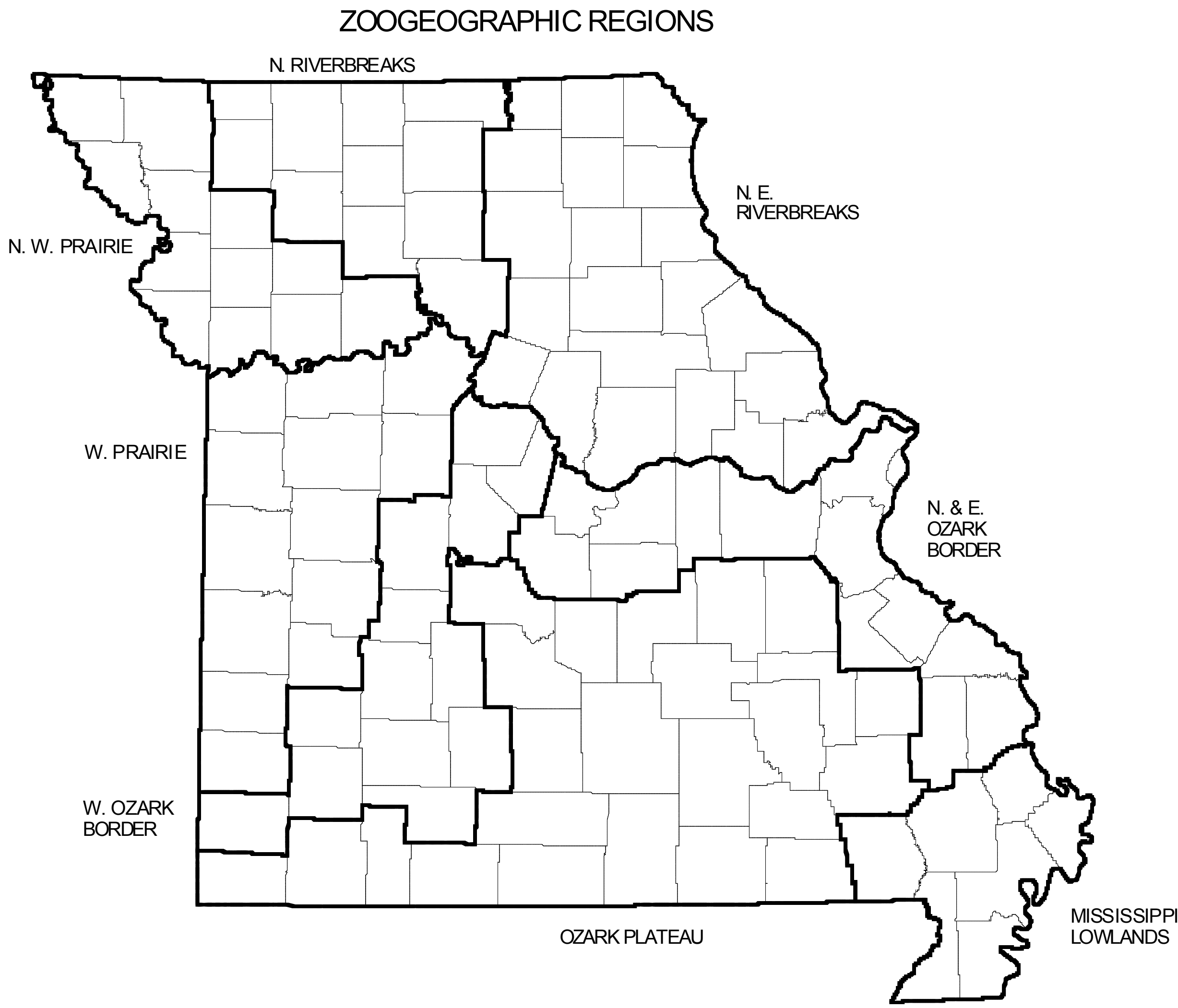

Figure 1. Zoogeographic regions of Missouri.

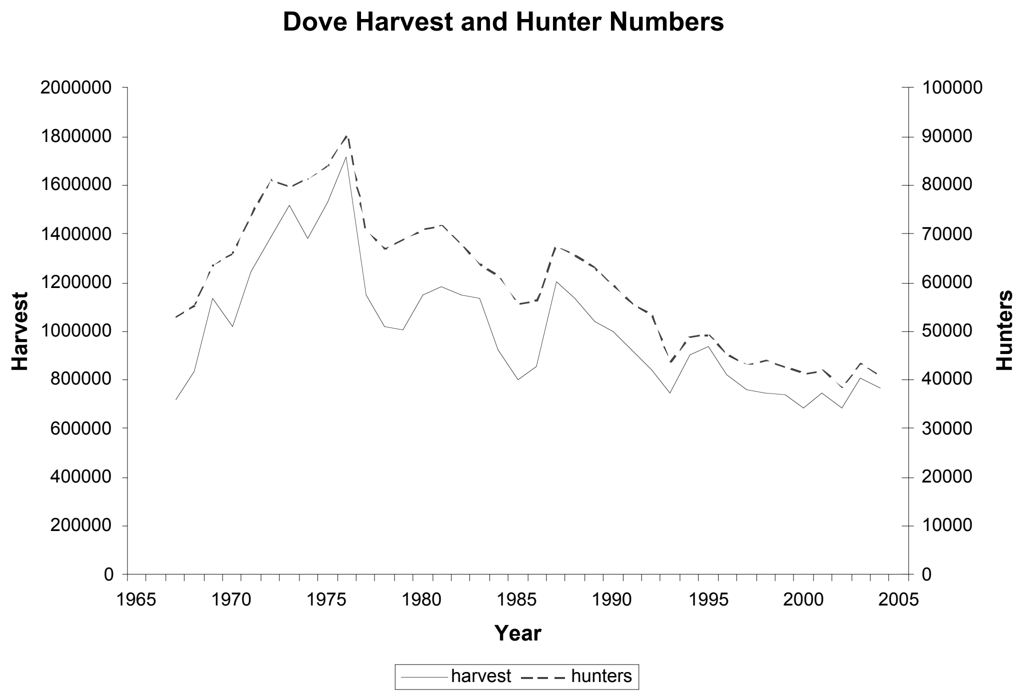

Figure 2. Long-term trends (1967 – 04) of mourning dove harvest and number of dove hunters in Missouri.

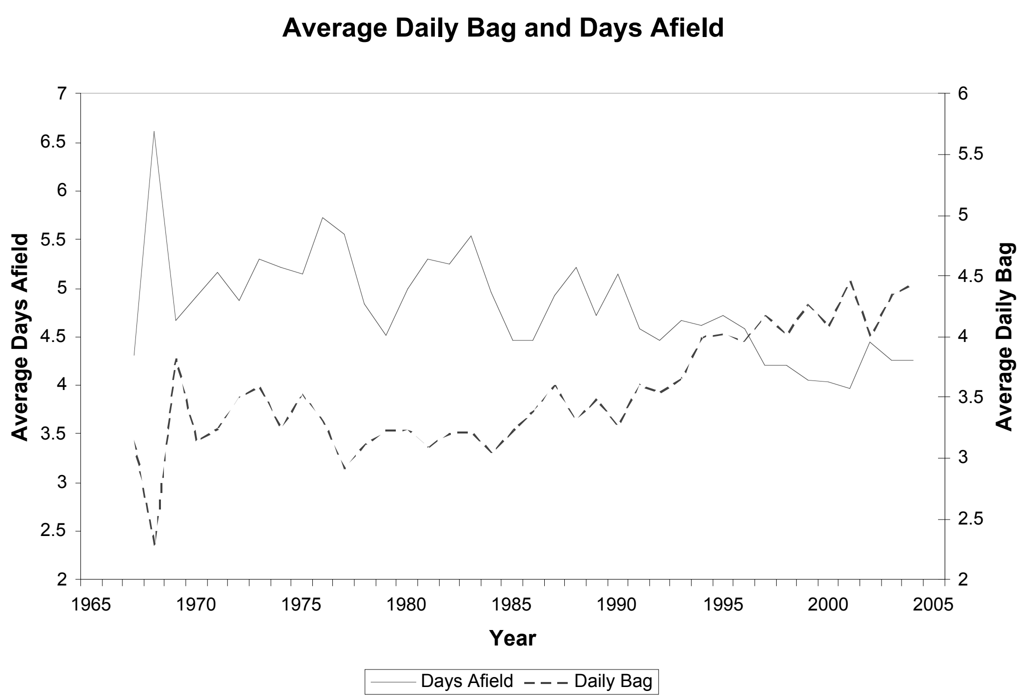

Figure 3. Long-term trends (1967– 04) of mourning dove average daily bag limit and average number of days afield for Missouri dove hunters.

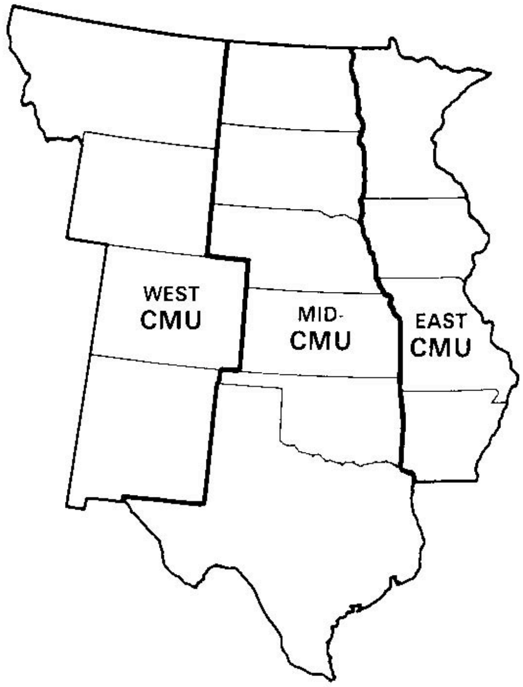

Figure 4a. Central Management Unit (CMU) states.

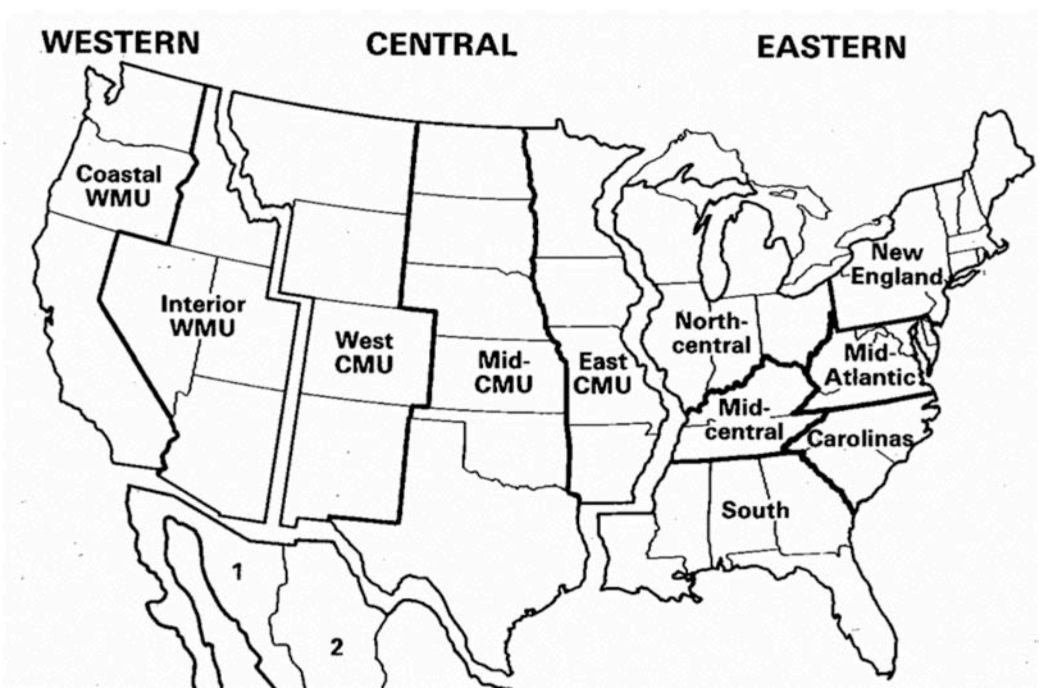

Figure 4b. Mourning dove management units across the United States.

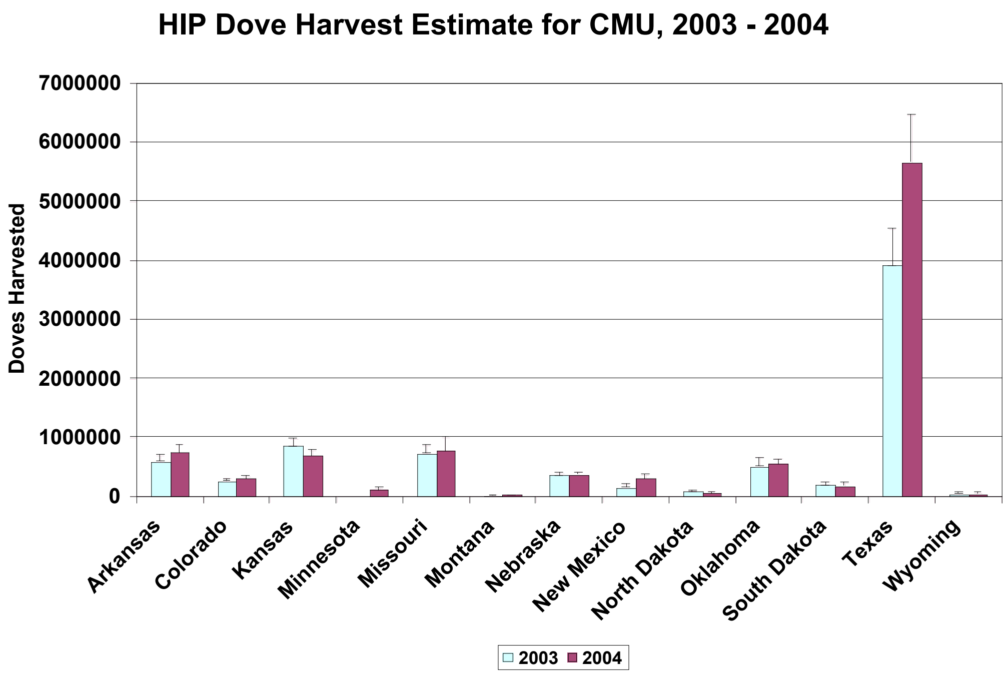

Figure 5. Harvest Information Program (HIP) estimates of mourning dove harvest in the Central Management Unit (CMU).

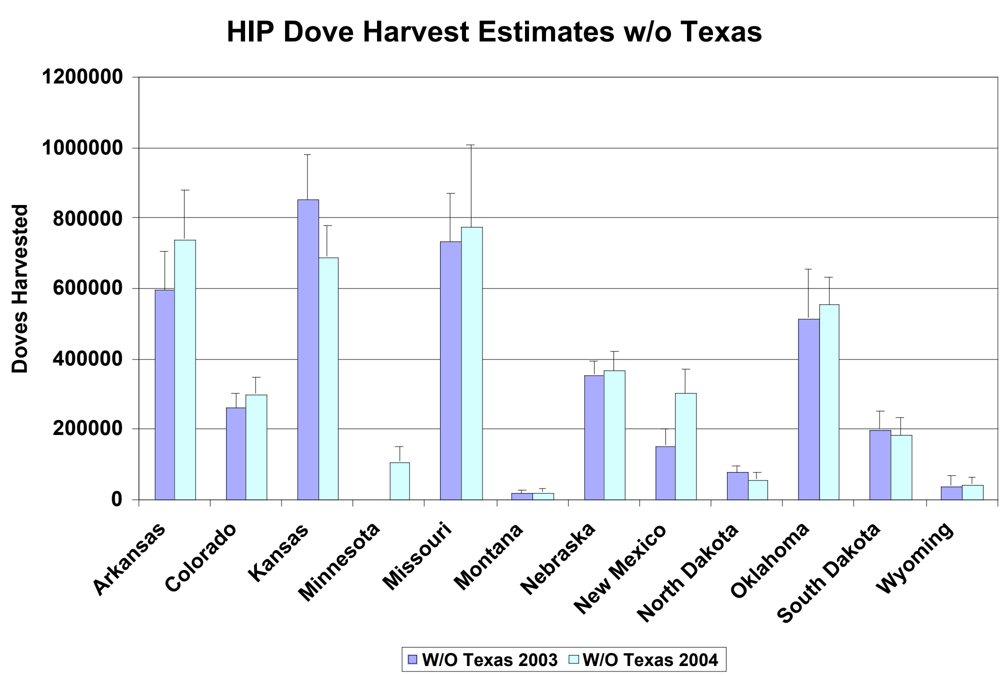

Figure 6. Harvest Information Program (HIP) estimates of mourning dove harvest in the Central Management Unit (CMU), without harvest estimates from Texas.

Figure 7. The proportion of almost 6,500 dove hunters by daily bag during September 2004 on 9 conservation areas providing managed shooting fields (see Table 3 for specific proportions for each area).

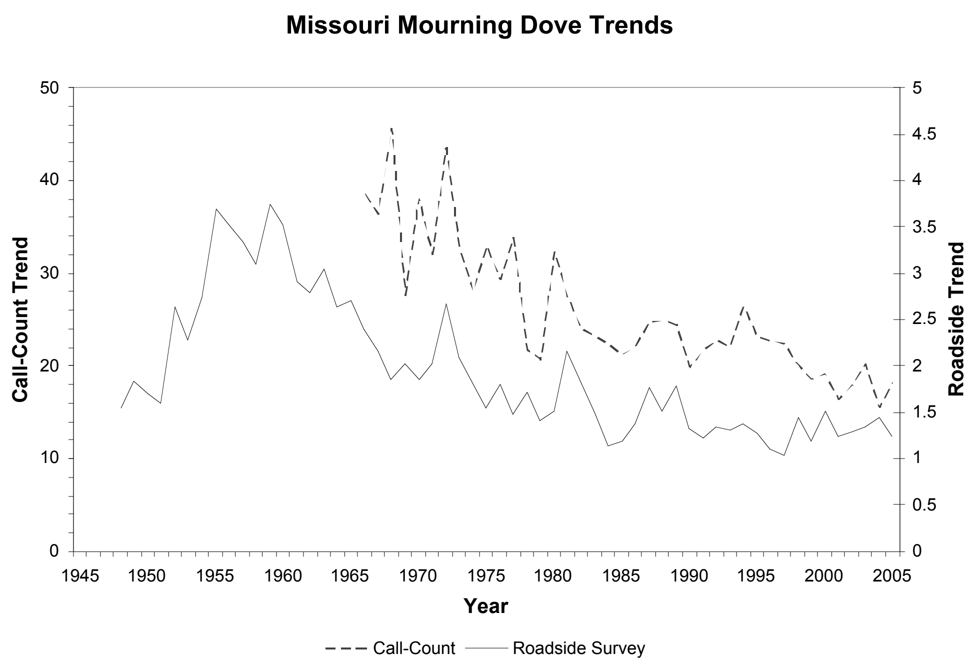

Figure 8. Missouri roadside mourning dove survey (RDS) expressed as doves/mile (1948 - 2005) and U.S. Fish and Wildlife Service mourning dove call-count survey (CCS) route regression trend analysis (1966-2005).

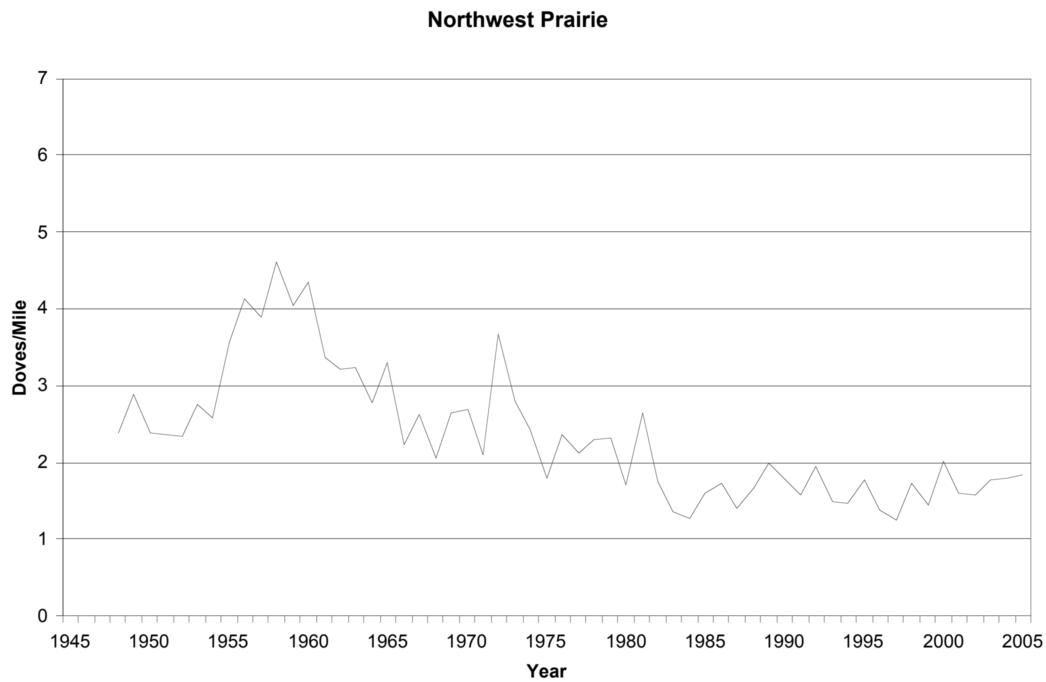

Figure 9. Northwest Prairie long-term trends.

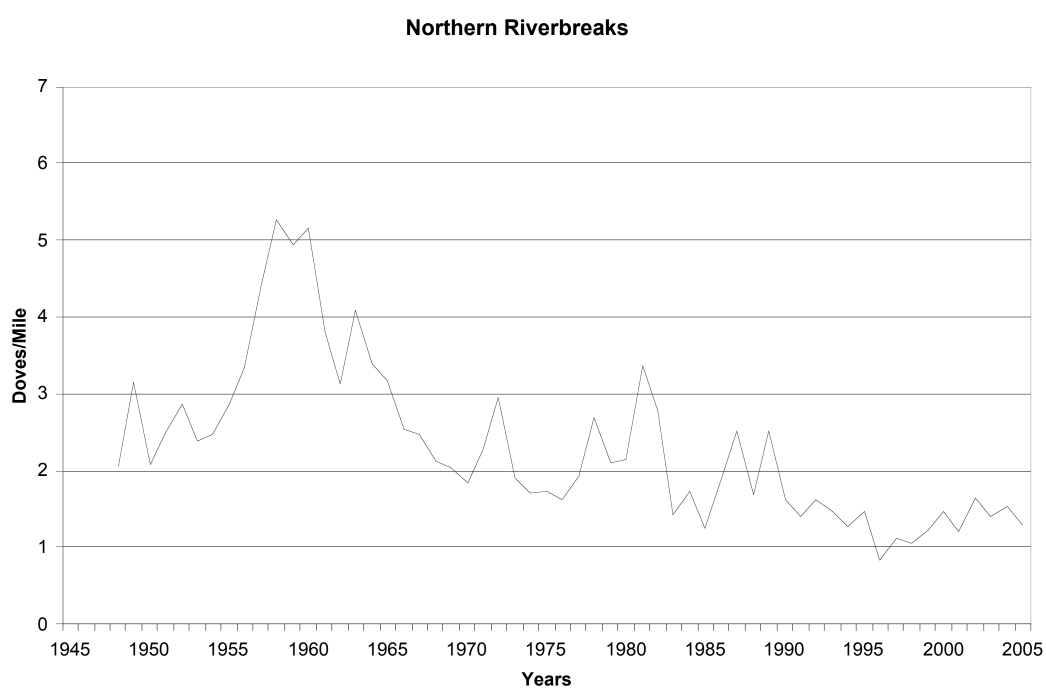

Figure 10. Northern Riverbreaks long-term trends.

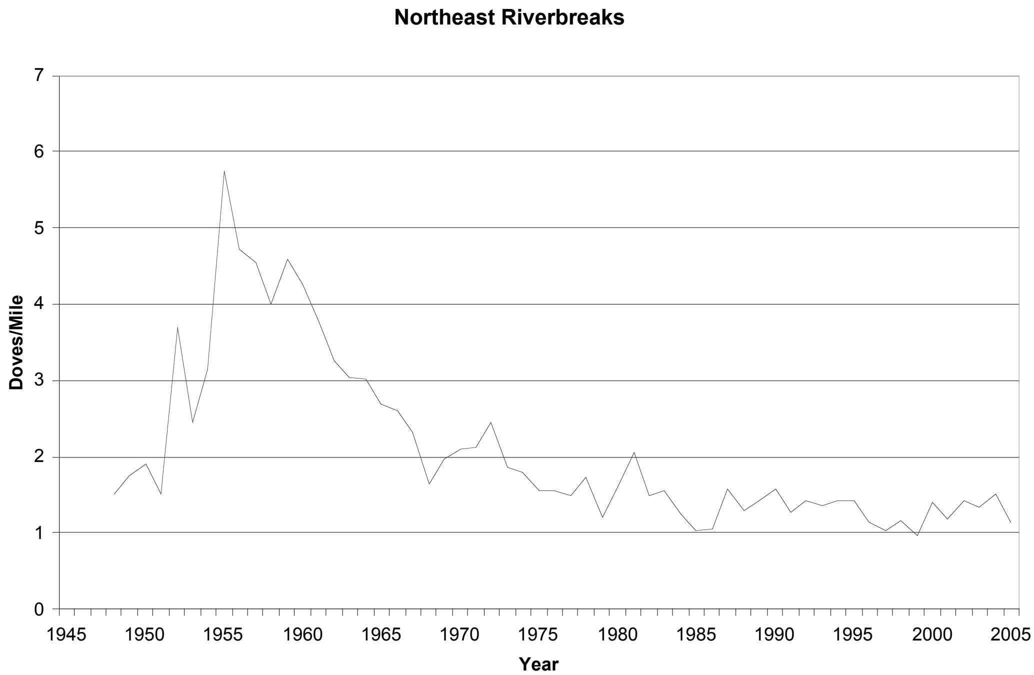

Figure 11. Northeast Riverbreaks long-term trends.

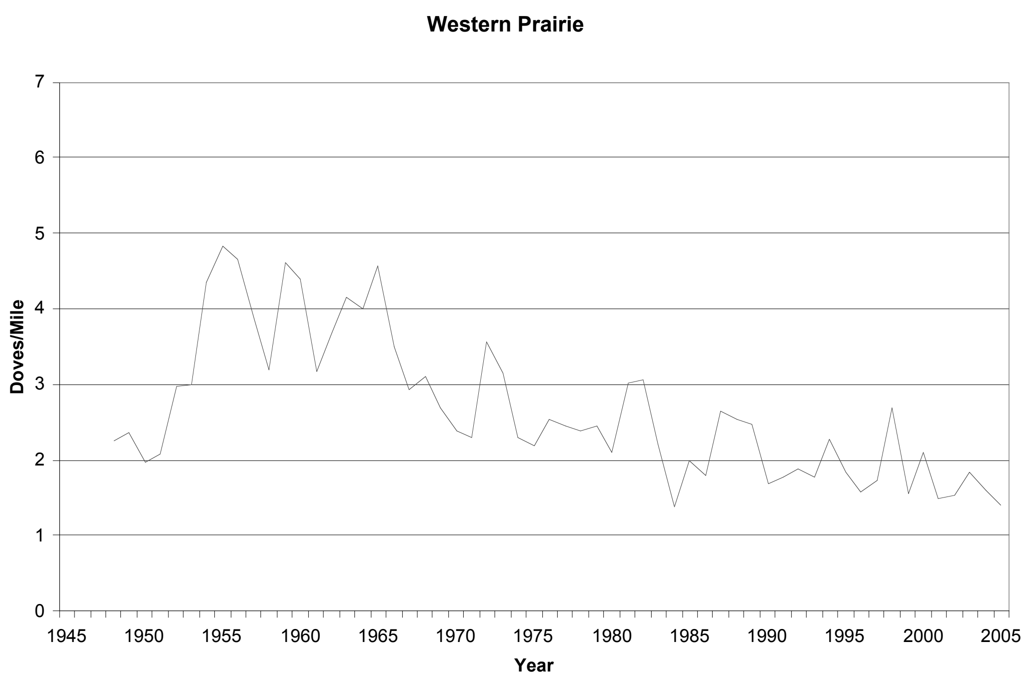

Figure 12. Western Prairie long-term trends.

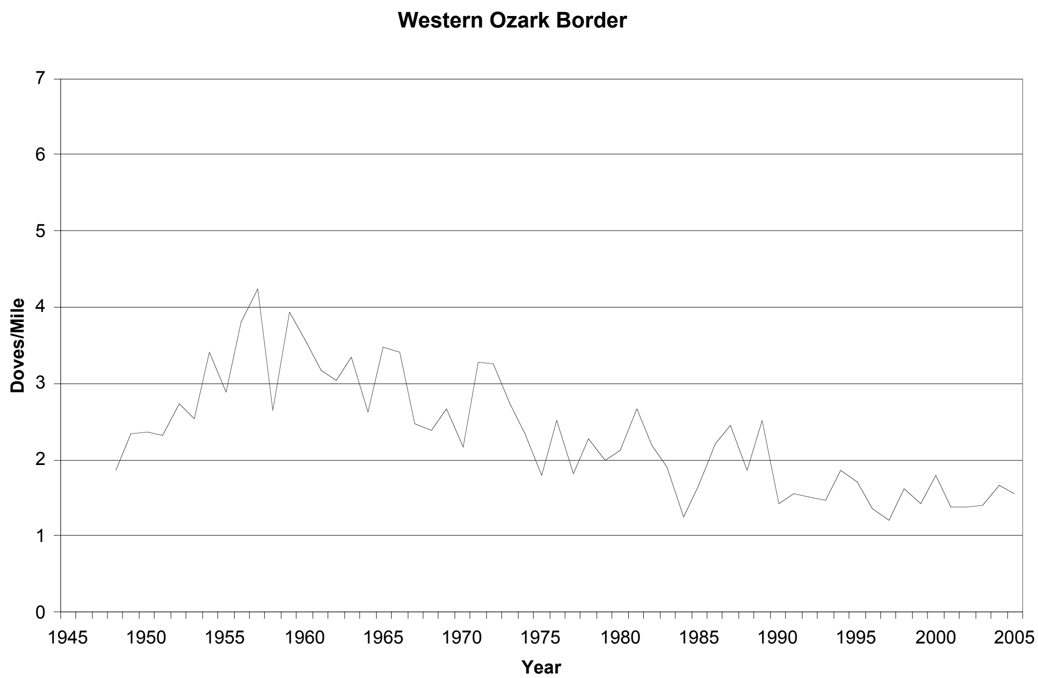

Figure 13. Western Ozark Border long-term trends.

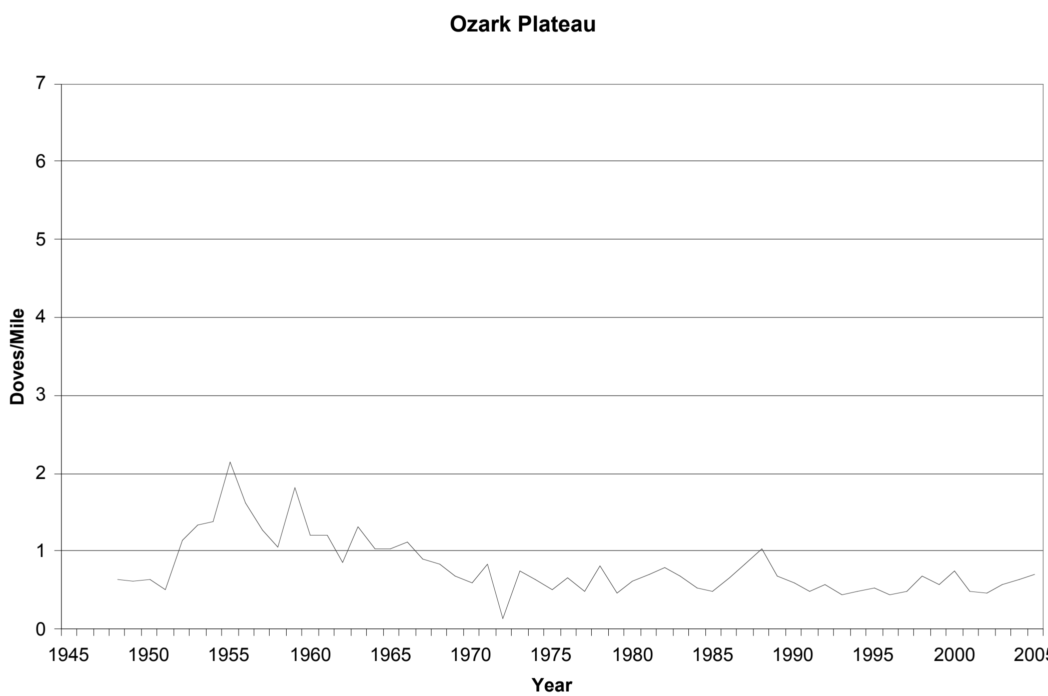

Figure 14. Ozark Plateau long-term trends.

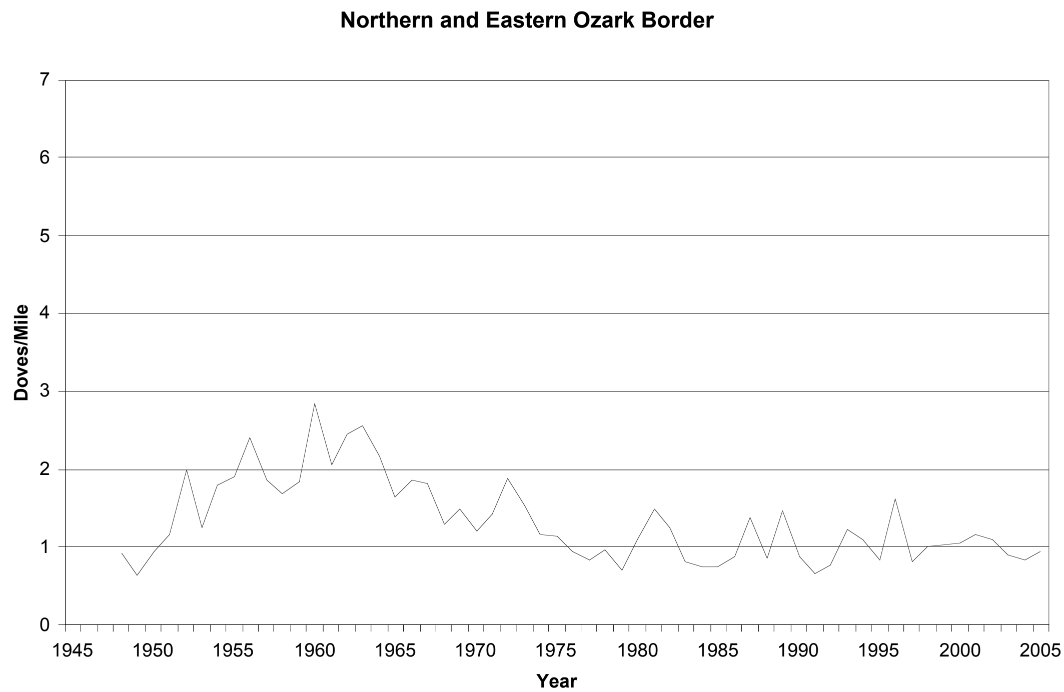

Figure 15. Northern and Eastern Ozark Border long-term trends.

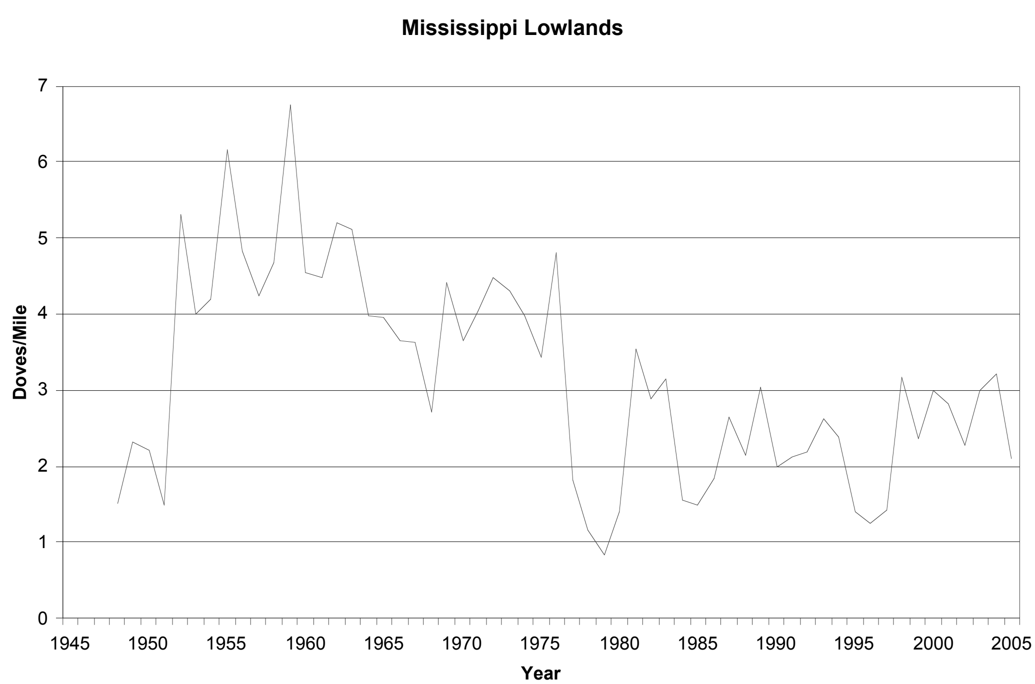

Figure 16. Mississippi Lowlands long-term trends.